

Coroner Debra Bell
Auckland Coroner's Office
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(email: csu.auckland@justice.govt.nz)

11 August 2019

Dear Coroner Bell,

I am writing to express concern regarding the recommendations published following the inquest into the death of baby Sapphire Williams in January 2017. I am writing on behalf of a group of doctors, predominantly from New Zealand, many of whom are mothers or have special expertise in lactation and breastfeeding medicine.

It is with sadness that we heard about Sapphire's death, and the subsequent inquest and recommendations received widespread media coverage. Our concerns specifically relate to the conclusion that breastfeeding from a mother who has consumed alcohol could result in such a dramatically high blood alcohol level in the infant. Relating to this conclusion, we disagree with the blanket recommendation that all breastfeeding mothers must avoid alcohol. This recommendation has the potential to mislead the public and professionals without specialty knowledge, and removes focus from other key issues which were identified in the inquest and may have contributed to Sapphire's death. I have attempted to address our concerns in detail below, as well as addressing the recommendations and how they relate to the current scientific literature and international recommendations.

Current recommendations:

It has been well-documented that there is no proven safe amount of alcohol that can be consumed by a woman when she is pregnant, or trying to become pregnantⁱ. However, pregnancy and lactation are two different physiological states – and there is no need for this to be such a strict recommendation during breastfeeding. This is agreed by multiple groups and agencies including the Australian Breastfeeding Associationⁱⁱ, the La Leche Leagueⁱⁱⁱ, the National Health Service (UK)^{iv} and the American Academy of Paediatrics^v, as well as the Academy of Breastfeeding Medicine^{vi}. Instead, moderation and sensible alcohol consumption is recommended, as it is with all non-pregnant adults.

Around two-thirds of mothers of babies three months or older will consume alcohol. If they consume alcohol, mothers who breastfeed are more likely to consume a low level rather than a high level, and are very unlikely to binge drink.^{vii} Leading breastfeeding authorities agree that a breastfeeding mother consuming alcohol in moderation is unlikely to put her baby at risk^{viii}.

A mother who has consumed one to two standard drinks would be under the New Zealand blood alcohol limit to drive (50mg alcohol/100ml). This mother would have a breastmilk alcohol level of 50mg/100mL (or 0.05% alcohol by volume) – which is the same as a glass of orange or apple juice, a ripe banana, and less than a glass of kombucha or some types of bread rolls. There is no documented evidence that a baby being fed breastmilk with this kind of alcohol concentration is at risk of harm. It seems reasonable that if a woman is safe to drive, she is safe to breastfeed her baby.

A recent cohort study from Australia reported that mothers who are breastfeeding will usually consume alcohol at a low level if they are going to consume any, and/or that they will employ strategies to minimise the alcohol passing to baby (such as waiting to feed). This study did not report any adverse health effects in babies under twelve months who were exposed to low levels of alcohol via breastmilk^{ix}.

Pharmacology and biology:

Alcohol enters the bloodstream and crosses readily to the breastmilk, with the blood alcohol and milk alcohol levels being roughly equivalent.^x The levels peak at 30-60 minutes after consumption, and then decline rapidly if no more is consumed (by around 15-20mg/ 100mL/ hour).^{xi} The levels in the milk fall in keeping with the fall in blood alcohol level, and there is no accumulation of alcohol in the breasts. We know that a person's blood alcohol level is influenced by various factors including the amount of alcohol that they have had to drink, their gender and their body weight. These factors similarly influence breastmilk alcohol concentration in lactating women.

Effects on the baby:

Despite the old wives tales, alcohol does not increase breastmilk production, or relax babies to help them sleep.^{xii} Alcohol inhibits the milk letdown reflex when at high levels in the mother's blood (after around five standard drinks), reducing the amount of breastmilk that the baby receives. It has been postulated that an even higher amount of alcohol (twelve standard drinks or above) could completely inhibit the suckling-induced oxytocin surge, meaning no milk letdown at all.^{xiii} Based on this, as intoxication increases, the milk ejected by the breast will be progressively limited, and

therefore there is some physiological minimisation of the volume of alcohol able to be transferred to the breastfeeding infant.

Babies who drink breastmilk containing moderate amounts of alcohol have been noted to have a short (less than 24 hour) change in their sleep pattern – they are more restless in sleep immediately following the alcohol ingestion. They then make up for that sleep change over the course of the following day.^{xiv} The effect does not linger. These babies also feed more frequently over the day after being exposed to alcohol – likely because of the reduced amount of milk available while the mother had a higher blood alcohol concentration. Babies who are exposed to extremely high amounts of alcohol may be more sleepy.

Babies exposed to high levels of alcohol via breastmilk, or prolonged repeated exposure, may have a delay in motor development^{xv}. This effect is not noted in breastfed babies whose mothers consumed little alcohol, or alcohol in moderation.

Data in human infants is limited to mainly observational research, but animal studies are often quoted in this area when the risks of breastfeeding and alcohol are discussed. In a rat study, the young who consume milk from a lactating mother who has ingested alcohol are more likely to be small due to reduced milk output^{xvi}. This finding has not been replicated in humans.

There are many singular case studies in the literature of adverse effects in babies exposed to alcohol, which are occasionally cited. Some of these date back to 1907^{xvii} and such historical anecdotes are not privileged to our current level of physiological understanding of breastfeeding. Case studies are often subject to bias and confounding, and in medicine are considered to represent low quality evidence when compared to controlled studies of larger patient groups.

In fact, in the literature to date, there are fewer than ten reported cases of acute alcohol intoxication in infants younger than 12 months. Only one of these babies died. None of these babies received the alcohol via breastmilk – they received it mixed into their infant formula (either accidentally or intentionally), or via the skin (such as using ethanol to clean the umbilical cord stump, or as a bath).^{xviii}

Maternal alcohol ingestion risks harm to the infant through the intoxication of the mother. Dangers include poor decision-making or judgement, accidental injury through dropping the baby, or falling asleep in bed with the baby while still under the influence of alcohol (and thus unsafely bedsharing). This could be considered to be

much more dangerous to the baby than the consumption of a small amount of alcohol via the breastmilk.

Infant formula as an alternative?

Breastfeeding is the biological norm, and is protective against many acute and chronic illnesses in both childhood and adulthood (including diabetes^{xix}, childhood cancers^{xx}, asthma and allergy^{xxi}). The use of infant formula reduces this protection. Babies who are mixed-fed are at an increased risk compared to their exclusively breastfed counterparts, and babies who are entirely formula fed are at an even higher risk, missing out completely on the protections afforded by breastmilk. The bacterial population in a baby's gut (the microbiome) starts to change dramatically from the very first bottle of infant formula that is introduced, and there is increasing research available on the importance of the microbiome for health^{xxii}.

Women are autonomous, and there is a large degree of loss of autonomy during pregnancy, when her body becomes subject to many restrictions. Some will prioritise their bodily autonomy over breastfeeding, and choose to introduce infant formula. Recommendations such as those released after Sapphire's inquest powerfully influence maternal decision-making regarding breastfeeding. There can be no doubt that this recommendation will make some women stop breastfeeding, or start to mix-feed their babies when they otherwise would have no indication to. This use of formula may be planned, it may be a result of having a "back-up" tin of formula available in case of consuming alcohol, or it may occur in a complete panic as the breastfeeding woman remembers or is told that her breastmilk will become harmful to her baby after the glass of wine she just had. In the context of maternal alcohol ingestion, the safe preparation of formula represents a risk which could pose more harm to the infant than that of minimal alcohol consumption via breastfeeding.

In summary, it is unproven that breastmilk containing a tiny percentage of alcohol is harmful to babies, but it is proven that there are risks associated with infant formula, a reduction in breastfeeding, or weaning entirely. There is simply no need to put this doubt or thought into women's minds.

Other effects of this recommendation:

By recommending that all mothers who breastfeed entirely abstain from alcohol, and emphasizing this specific aspect of the case, the potential to make otherwise meaningful recommendations and learn from Sapphire's death was lost. Instead of placing the blame and responsibility on an individual or group of individuals, change could have been made on a population level. What could have been

learnt from this case, is what moderation looks like for breastfeeding mothers, or what steps mothers could take to help increase safety.

Possible alternative recommendations:

- If breastfeeding mothers choose to consume alcohol, it should be in moderation, as with other non-pregnant adults. There is no evidence of harm to babies if mothers consume one or two alcoholic drinks.
- If there is expressed breast milk available, then a mother who has ingested alcohol could choose to feed this to her baby instead of breastfeeding, and wait for an hour or two before feeding her baby from the breast instead. If expressed breast milk is not available ahead of time, it is still likely to be safer for baby to be fed breastmilk with a tiny percentage of alcohol, than it is to introduce artificial baby milk (with the risks of this outlined previously).
- Women who have been ingesting alcohol can express their breastmilk if they need to for comfort or to maintain milk supply. Alcohol levels in milk decline in keeping with levels in blood, and pumping it out won't reduce the alcohol in the breasts. The expressed milk can be given directly to baby if the mother has been drinking in moderation, or it can be diluted with non-alcoholic milk and given later.
- If a breastfeeding mother is planning on consuming large amounts of alcohol, then she needs to have the support of somebody who is sober to care for her baby while she is inebriated. She should be supported to express breast milk for the baby ahead of time.
- If a breastfeeding mother consumes a large amount of alcohol without planning ahead and storing expressed milk, she is still likely to be safer to breastfeed her baby than to begin the process of introduction of infant formula (especially if she waits after peak concentration time to feed). This is due to the risks previously discussed. Most importantly, she needs help to care for this baby – and there needs to be some thought about the mother's circumstance and supports, if excessive alcohol use is occurring.
- If a breastfeeding mother consumes alcohol, she should not share a bed with her baby because she is not likely to be as aware of her environment. Bedsharing can be a safe way of sleeping for breastfeeding mothers and babies, but there are guidelines that should be followed to ensure safety.
- Women should use common sense and discretion when it comes to consuming alcohol in the context of young babies, premature babies, small babies or sick babies.
- Women should consider making sure that breastfeeding is well established before introducing alcohol (for the aforementioned risks of it reducing milk supply, or affecting infant sleep).

- Women can download apps for their phones to help plan or estimate when their breastmilk will be free of alcohol (like Feed Safe).
- There is support available for all mothers, breastfeeding or not, who are concerned about their alcohol intake or their use of alcohol to “get through” their days of parenting. Mothering small children is incredibly difficult at times, and often isolating, and alcohol dependence for these women is a very real problem.

Recommending that all breastfeeding women remain sober for the entirety of their breastfeeding journey isolates the breastfeeding mother in today’s society. The World Health Organisation recommends that babies are exclusively breastfed until around six months of age, and continue to be breastfed until at least the age of two years^{xxiii}. It is not fair to scaremonger and recommend every mother remains alcohol-free for the duration of her time trying to conceive, her pregnancy, and then two years or longer of breastfeeding. Breastfeeding mothers already get an incredibly hard time in our culture. While it is recommended to breastfeed, it somehow seems to offend individuals when breastfeeding goes on too long, or stops too early, or is done in public, or while pregnant, or when eating certain foods or taking medications. A breastfeeding mother’s body is subject to a lot of arbitrary rules and perspectives by the public. Recommendations around alcohol consumption contribute to negative societal perception of breastfeeding, instead of promoting inclusivity. This serves only to isolate mothers further.

Is it possible for an infant to have such a high blood alcohol level solely from breastfeeding from a mother who had consumed alcohol?

It was reported that baby Sapphire’s blood alcohol level, in her heart, was 308mg/ 100mL. This test was run more than once, could not be explained by the pathologist, and was not correlated by a high alcohol level in her stomach or liver. This is an incredibly high blood alcohol level. It would make many adults comatose. For Sapphire to have a level this high in her blood, she would have had to consume an incredible amount of alcohol. One would hope that the blood alcohol level of the second twin was also tested, as well as the blood alcohol and breastmilk alcohol levels of the mother, in order to link Sapphire’s blood alcohol level to breastfeeding. I have completed some calculations based on the information available in the public domain and have attached my work as an Appendix.

When the information publicly available is used, and combined with the science of alcohol ingestion and metabolism, as well as infant feeding knowledge – it can be calculated that the maximum blood alcohol concentration that baby Sapphire could have reached by

ingesting her mother's breastmilk is 34mg alcohol/ 100mL of blood. This is a tenth of what has been reported.

To reach a blood alcohol level of over 300mg/ 100mL, she would have needed to consume 6.47g of ethanol. To achieve this, she would have needed to consume a litre of milk in a single feed from a mother with a blood/ breast alcohol level of 700mg/ 100mL. Alternatively, if she had a normal-sized breastfeed, then her mother's blood alcohol level would have had to be 6470mg/ 100mL – for which the mother would have had to consume over 200 standard drinks (and is a blood alcohol level 4-5 times the highest blood alcohol levels ever recorded).

The numbers don't make sense here. Therefore it does not make sense for breastmilk alone to have killed this baby, and so it is unfair for the sole recommendation to come from this case to be that breastfeeding mothers should consume zero alcohol.

There are so many factors at play here. Deprivation, poverty, homelessness, health inequity, unsafe bedsharing. What circumstances led to this mother binge drinking so soon after bringing her preterm twins home from the hospital? There must have been a lack of wraparound support in place for this homeless family with seven children. To blame this on breastfeeding alone is bizarre. In fact, it is even more important for babies born into poverty to be breastfed – not to have their mothers dissuaded from doing so.

In summary:

We are surprised that the conclusion reached in this case was that baby Sapphire died from alcohol ingestion through breastfeeding. This does not appear to be physiologically possible given the information available to us, and does not fit with the current evidence around breastfeeding and infant exposure to alcohol. In fact, it seems that it would be the world's first reported case of acute alcohol intoxication and death from breastfeeding.

We are disappointed that the recommendation was that women who are breastfeeding must not consume alcohol. Breastfeeding is so incredibly important. There should be a lot of consideration before sweeping statements are made that could undermine breastfeeding, alienate breastfeeding mothers, and subvert all the good work that is put in to informing women about breastfeeding. An opportunity to enhance the breastfeeding narrative has been missed here, by an influential government agency, which is likely to disadvantage mothers and children.

We are available for correspondence via the primary author of this letter (Dr Heather Johnston) should you wish to respond.

Kind regards,

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Appendix I: Calculations to estimate the blood alcohol concentration in baby Sapphire

Assumptions made in these calculations – endeavouring to overestimate rather than underestimate, to ascertain the “worst case scenario”

- That the information reported by the media was accurate
- That the mother was an estimated body weight of 70kg, and not a chronic alcoholic
- That baby Sapphire was around 3kg (one week old when gestational age adjusted for prematurity)
- That the case of alcoholic drinks were high percentage (7%) and moderate volume (250mL)
- That all 18 drinks were consumed in quick succession to get the highest blood alcohol concentration possible in the mother
- That she fed baby Sapphire at the peak concentration of alcohol in her blood and milk
- That baby Sapphire had a large feed of 100mL of breastmilk (given her age, likely size, and the uncertainty of maternal milk supply as she predominantly used formula, but was also a mother of twins)

Background information:

- Twin babies were born at 33 weeks gestation and low birth weight, and baby Sapphire died 8 weeks later – therefore they were eight weeks old, or only one week old when gestational age was corrected for prematurity, and therefore probably around 3kg looking at growth charts for premature babies.
- The articles mention a “case” of 18 premixed bourbon and cola. After doing some research about what meets that description – we are looking at 250ml cans, 7% ABV (one standard drink per can).
- $7\% \text{ of } 250\text{ml} = 17.5\text{ml of alcohol per can} \times 0.789 \text{ (density of ethanol at room temperature)} = 13.8\text{g of alcohol per can}$

If all 18 cans were consumed by mum = a total 248g of alcohol consumed.

This would be a maternal blood alcohol level of around 700mg/100mL (above lethal levels for most people).

Estimating a maternal body weight of 70kg, and a mother who drank 18 standard drinks, 13.8g alcohol each, and if she consumed them all at the same time to get the highest concentration of alcohol in her blood

- If she breastfed at the peak concentration of alcohol (30-60min after consumption), assuming complete absorption, a volume of distribution in of 35L and no maternal metabolism:
 $(13.8/35) \times 18 = 7.097\text{g/L of alcohol into her breastmilk (which is the same as her blood alcohol content)}$

With a baby fed milk directly from the breast, it is impossible to know exactly how much milk she received. However, we can estimate.

- General guidelines for feeding new babies is to give them 150mL/ kg/ day. If she was 3kg, that would be 450mL over a day (and an eight week old, or one week adjusted gestational age baby should receive a minimum of eight feeds a day = less than 60mL per feed).
- One of the media articles stated that the babies were mostly formula fed, but that they received occasional breastmilk - this would reduce mum's milk supply. However, they were also twins - which could increase mum's milk supply.
- I have estimated a feed at 100mL as a big feed for a baby of this size and situation

If baby was 3kg and had 100mL of breastmilk, and a body water of 70%:

$$\begin{aligned} & (0.1\text{L milk} \times 7.097\text{g/L alcohol in milk}) / (0.7\text{L/kg} \times 3\text{kg}) \\ & = 0.7097 / 2.1 \\ & = 0.338\text{g alcohol/ L blood} \end{aligned}$$

= A maximum of 33.8mg/ 100mL blood alcohol level in baby when units are converted.

Framed differently/ worked backwards:

- To obtain a blood alcohol level of 308mg/100mL, the same baby would have had to consume 6.47g of ethanol.
[308mg/100mL = 3.08g/L (unit conversion)
3.08 x 2.1 = 6.47g of alcohol]
- If she had the same 100mL feed, the milk alcohol level would have been 6.47g in 0.1L (or 64.7g /L)
- In order for a level of 64.7g/L in milk, mum's blood alcohol level would have to be equivalent, and when the units are converted, 64.7g/L = 6470mg/100mL.
- A blood alcohol level of 6470mg/ 100mL can also be written as 6.47% - more than four times the highest blood alcohol level ever recorded, 129 times the legal driving limit, and 7-13 times the upper limit where alcohol-related death is likely.
- A "standard drink" in New Zealand is equivalent to 10g of alcohol. In order to obtain a blood alcohol level of 6470mg/ 100mL, this mother would have needed to consume 226 standard drinks, or more than 9 cases of the premixed

bourbon and colas that she was reported to be drinking the night before her baby died.

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